

REMARKS/ARGUMENTS

In view of the amendments made to the specification and claims, and in view of the following remarks, reconsideration of the application is respectfully requested.

Claim objections

Claims 1, 20 and 24 have been objected to because of various informalities. Specifically, there was a typo in the order of roman numerals within each claim. By the present amendment, claims 1 and 24 have been amended to correct this minor informality and claim 20 has been canceled. Additionally, claims 1, 5, 8, 9, 10, 12, 22 and 24 have been amended to delete "AC-only" as it modifies ion guide, claim 19 has been amended to delete the word "preferably", and claim 21 now includes reference to a vacuum pressure.

Drawings

The drawings have been objected to for failing to comply with 37 C.F.R. § 1.84 because they include the reference numeral 5 not discussed in the specification. Applicant has submitted substitute sheets of drawings, along with proposed changes marked on an annotated copy of the drawings, wherein the numeral 5 has been deleted from the drawings. It is requested that the Examiner approve these changes.

Claim rejections under 35 U.S.C. § 103

Claims 1-24 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith et al. (U.S. Patent No. 6,107,628) in view of Franzen (U.S. Patent No. 5,815,055). Essentially the Examiner has alleged the Smith et al. reference shows all the limitations of the claims except that Smith et al. does not teach an ion guide with at least 90% of the apertures being substantially the same size. The Examiner then suggests that Franzen teaches that it is necessary to reduce substance and ion losses in all steps from

ion generation to measurement and therefore it would be obvious to modify Smith et al. to include: varying the number of electrodes; using the same sized diameters or different sized diameters in the electrodes; and varying the length and operating pressures to reduce losses. Applicant respectfully traverses this rejection.

The present invention pertains to guiding ions which have a wide range of mass to charge ratios through an upstream portion of a mass spectrometer. A mass analyzer is provided in a separate vacuum chamber maintained at a lower pressure and separated by a differential pumping aperture. As such, the claims recite an ion guide comprising a plurality of electrodes having apertures that are aligned and at least 90% of which are substantially the same size. Also claimed is a differential pumping aperture electrode disposed between an input vacuum chamber and an analyzer vacuum chamber allowing the analyzer vacuum chamber to be maintained at a low pressure. Note that the input vacuum chamber is maintained at a pressure selected from numerous different pressures.

U.S. Patent No. 6,107,628 to Smith et al. relates to an ion funnel operated in a high pressure regime. While there are numerous differences between ion tunnels and ion funnels, at the very least, and as the Examiner has noted, an ion funnel does not anticipate at least 90% of the apertures being substantially the same size. By contrast, the ion funnel has apertures that change in size as can be clearly seen in Figure 1 of the '628 reference.

U.S. Patent No. 5,818,055 to Franzen is specifically directed to transporting ions into a 3-D quadropole ion trap at specific times. See for example Figure 4 and note that the capture intervals for high and low energy ions are a small portion of the overall cycle. See also the discussion in column 2, lines 45-49. This basic arrangement is only suitable for ions that have a certain mass to charge value. Where ions having different mass to charge values are received, an opposing field, collision gas or alternatively reducing the spacing of the diaphragms must be used for the unit to function. See column 4. Additionally note that the traveling field apparatus is specifically provided immediately upstream of the ion trap and hence provided in the downstream portion of a mass

spectrometer. Indeed the Franzen reference specifically discusses the prior art having differential pump chambers and notes that a critical step is the introduction of ions from the RF ion guide into the quadropole ion trap. See column 2, lines 42-44. Nowhere in the reference is there any suggestion of placing a traveling field apparatus anywhere other than directly in front of an ion trap 5, 6, 7. Indeed a multiple rod system 1 can be clearly seen upstream of the traveling field apparatus. Note the discussion in column 5, lines 22-31 and the embodiment shown in Figure 1.

Applicant respectfully submits that the rejection under 35 U.S.C. § 103 is not proper because the Franzen reference does not teach an ion guide **wherein at least 90% of apertures are substantially the same size located in an input vacuum chamber.** Although different stages of differential pumping are disclosed in column 2, lines 1-4 of the Smith reference, **neither Smith et al. nor Franzen teach a traveling field anywhere other than just before an ion trap.** Indeed, placing a traveling field anywhere else would be totally contrary to the teachings of Franzen and therefore not an obvious change.

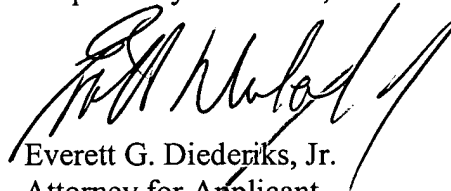
In regards to the dependent claims, Applicant feels that they are also further limiting and thus patentable for additional reasons. However, since they are clearly allowable by virtue of their dependency, they will not all be discussed in detail. However, with specific reference to claims 22 and 23, Applicant notes that claims 22 and 23 require two interleaved comb arrangements. A reasonable interpretation of the words "comb arrangement" consistent with the disclosure would be a longitudinally extending member having a plurality of electrodes depending therefrom. Such electrodes may be intervals of a bar and the comb arrangements can be machined from solid metal rods. It has been found that these comb arrangements are relatively simple to manufacture, at least when compared to an ion funnel arrangement. They are also inherently more rugged. By contrast, the Franzen reference appears to disclose only electrical leads of no significant structural strength. Note for example, leads 3 and 4 shown in Figure 3.

New Claims

New claims 25-69 have been presented. In regards to claims 25-31 and 67-69, these claims are generally considered to be allowable at least for similar reasons to claims 1 and 20 argued above. With regards to claims 33-66, these claims are being presented to more specifically define the subject matter of claims 22 and 23.

In view of the above remarks, and the amendments made to the specification and claims, it is respectfully submitted that the application should now be in clear condition for allowance such that allowance of all the claims and passage of the application issue is respectfully requested. If the Examiner should have any additional concerns regarding the allowance of this application, he is cordially invited to contact the undersigned at the number provided below if it would further expedite the prosecution of the application.

Respectfully submitted,



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Date: September 17, 2003
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